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REPORT FOR CONSULTATION ON THE METROPOLITAN ALBUQUERQUE INTRASTATE AIR QUALITY CONTROL REGION (NEW MEXICO)

National Air Pollution Control Administration
Washington, D. C.

July 1970

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REPORT FOR CONSULTATION
ON THE
METROPOLITAN ALBUQUERQUE
INTRASTATE AIR QUALITY CONTROL REGION
(NEW MEXICO)

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

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The basic background information is presented for the consultation with state and local authorities prior to the designation of air quality control regions as stipulated in the Clean Air Act. Boundaries for the regions are proposed and the factors which are the basis for the proposed boundaries are discussed. Reports for consultation consider these factors: geography; population and economic activity; their prospective growth; probable direction of physical growth; the emission inventory and the location of sources; air quality and pollution transport analysis; regional planning; air pollution control; and governmental jurisdictions.

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PUBLIC HEALTH SERVICE
National Air Pollution Control Administration

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PREFACE

The Clean Air Act, as amended, directs the Secretary of Health, Education, and Welfare to designate "air quality control regions" to provide a basis for the adoption of regional ambient air quality standards and the implementation of those standards. The Act stipulates that the designation of a region shall be preceded by consultation with appropriate State and local authorities. This report is intended to provide background information for a formal consultation. It proposes boundaries for the Metropolitan Albuquerque Intrastate Air Quality Control Region and discusses the factors which are the basis of the boundary proposal.

The Region boundaries proposed in this report reflect consideration of available and pertinent information. However, the proposed boundaries remain subject to revisions suggested during the consultation with State and local authorities. Formal designation of the Region will be made only after a careful review of all opinions and suggestions submitted during the consultation process.

The National Air Pollution Control Administration appreciates assistance received from the New Mexico Health and Social Services Department and the Albuquerque-Bernalillo County Environmental Health Department.

INTRODUCTION

THE REGIONAL APPROACH

Air pollution in the urban areas of the United States is a regional problem which frequently extends across State and local governmental boundaries. Since air pollution problems are rarely confined to any single municipality or county, successful control requires coordinated planning, standard setting, and enforcement by the several political jurisdictions which share a common problem. To date, State and local governments across the Nation have only begun to develop a regional approach to air pollution control.

The Clean Air Act, as amended, provides a regional approach which depends upon coordination and cooperation among all levels of government; municipal, county, State, and Federal. To set in motion the machinery for regional air pollution control, the Department of Health, Education, and Welfare designates air quality control regions, issues air quality criteria, and publishes reports on control techniques. The region designation identifies those State and local jurisdictions which will be involved in a regional air pollution control effort. The air quality criteria indicate the extent to which various concentrations of air pollutants are harmful to health and damaging to property. The reports on control techniques provide information on the costs and effectiveness of various techniques for controlling air pollutant emissions.

After the Department of Health, Education, and Welfare completes these initial steps, State governments adopt ambient air quality standards and develop plans for implementation of those standards for areas within air quality control regions. An air quality standard defines the desired limit on the concentration of a pollutant in the ambient air of a region. It represents the level of air quality which the regional control program will attempt to achieve. An implementation plan is a blueprint of the steps which will be taken to insure achievement of the air quality standards within a reasonable time. The Governors have 90 days either from the time that they are furnished the criteria and control technology reports or from the time that a region is designated by the Department of Health, Education, and Welfare - whichever occurs last - to submit letters indicating their intent to set standards. They have an additional 180 days to set the standards, and another 180 days to develop plans for implementing those standards. The procedure for setting standards includes a public hearing which allows residents of a region to express their views concerning desired standards.

The Department of Health, Education, and Welfare reviews air quality standards and implementation plans in order to ascertain their consistency with the provisions of the Clean Air Act, as amended.

When air quality standards and implementation plans are approved, States proceed to prevent and control air pollution in accordance with those standards and plans. This system for establishing a regional approach to air pollution control is outlined in Figure 1.

DESIGNATION OF AIR QUALITY CONTROL REGIONS

Designation of an air quality control region is one of the first steps in the regional approach to air pollution control. Section 107(a)(2) of the Clean Air Act, as amended, directs the Secretary, Department of Health, Education, and Welfare to make such designations. The portions of the section relevant to this discussion state:

> "...The Secretary, after consultation with appropriate State and local authorities shall...designate air quality control regions based on jurisdictional boundaries, urban industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards. The Secretary may... revise the designation of such regions...The Secretary shall immediately notify the Governor or Governors of the affected State or States of such designation."

Procedure for Designation of Regions

Figure 2 illustrates the procedures used by the National Air Pollution Control Administration (NAPCA) to designate air quality control regions.

After evaluating relevant technical and urban factors, the National Air Pollution Control Administration publishes a proposed delineation of the region boundaries. At the same

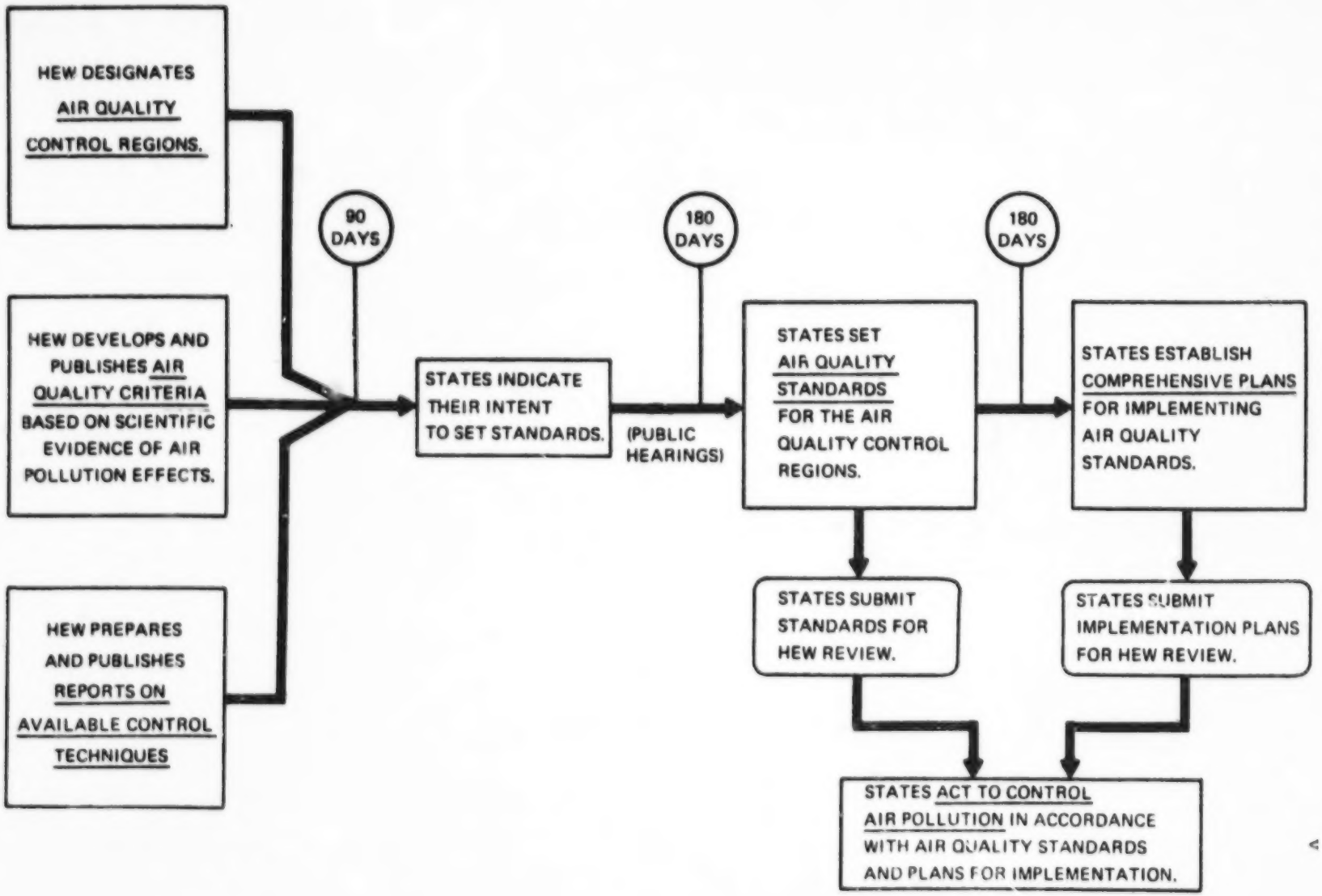
HEW DESIGNATES AIR QUALITY CONTROL REGIONS.
HEW DEVELOPS AND PUBLISHES AIR QUALITY CRITERIA BASED ON SCIENTIFIC EVIDENCE OF AIR POLLUTION EFFECTS.
HEW PREPARES AND PUBLISHES REPORTS ON AVAILABLE CONTROL TECHNIQUES
90 DAYS
STATES INDICATE THEIR INTENT TO SET STANDARDS.
180 DAYS
(PUBLIC HEARINGS)
STATES SET AIR QUALITY STANDARDS FOR THE AIR QUALITY CONTROL REGIONS.
180 DAYS
STATES ESTABLISH COMPREHENSIVE PLANS FOR IMPLEMENTING AIR QUALITY STANDARDS.
STATES SUBMIT STANDARDS FOR HEW REVIEW.
STATES SUBMIT IMPLEMENTATION PLANS FOR HEW REVIEW.
STATES ACT TO CONTROL AIR POLLUTION IN ACCORDANCE WITH AIR QUALITY STANDARDS AND PLANS FOR IMPLEMENTATION.

Figure 1 FLOW DIAGRAM FOR ACTION TO CONTROL AIR POLLUTION ON A REGIONAL BASIS, UNDER THE CLEAN AIR ACT, AS AMENDED

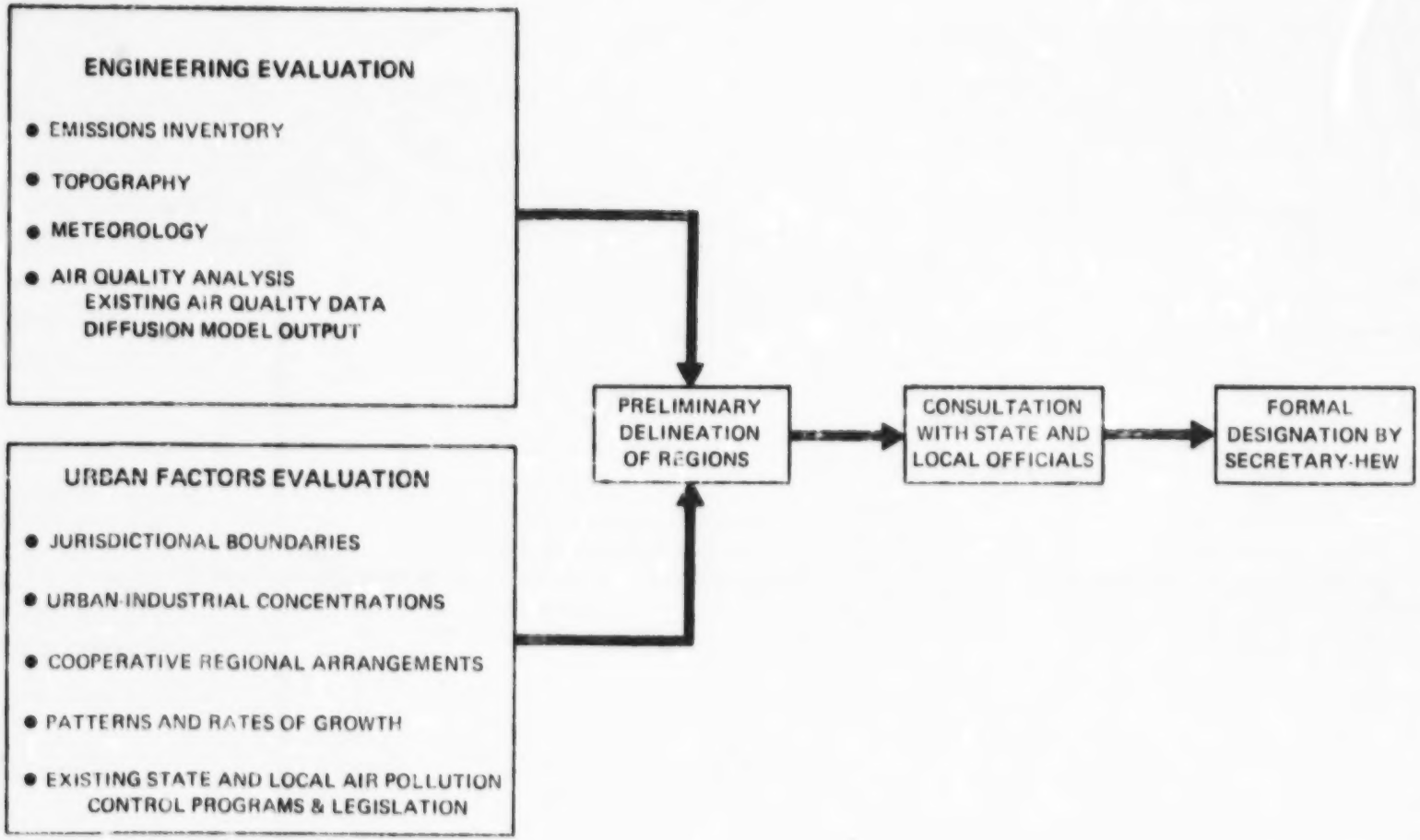
ENGINEERING EVALUATION
• EMISSIONS INVENTORY
• TOPOGRAPHY
• METEOROLOGY
• AIR QUALITY ANALYSIS
EXISTING AIR QUALITY DATA
DIFFUSION MODEL OUTPUT
URBAN FACTORS EVALUATION
• JURISDICTIONAL BOUNDARIES
• URBAN-INDUSTRIAL CONCENTRATIONS
• COOPERATIVE REGIONAL ARRANGEMENTS
• PATTERNS AND RATES OF GROWTH
• EXISTING STATE AND LOCAL AIR POLLUTION CONTROL PROGRAMS & LEGISLATION
PRELIMINARY DELINEATION OF REGIONS
CONSULTATION WITH STATE AND LOCAL OFFICIALS
FORMAL DESIGNATION BY SECRETARY-HEW

Figure 2. FLOW DIAGRAM FOR THE DESIGNATION OF AIR QUALITY CONTROL REGIONS.

time NAPCA sets a time and place for a consultation meeting and distributes to State and local authorities a report of the evaluation study (such as this "Report for Consultation") which includes the boundary proposal. At the consultation meeting State and local authorities are encouraged to present fully their views and suggestions concerning the proposed boundaries of the region. Interested parties who do not have official status may submit comments in written form for the record. After careful review of all suggestions and opinions submitted for the record by interested parties, the Secretary of Health, Education, and Welfare makes a formal designation of the region boundaries and notifies the Governor(s) of the State(s) affected by the designation.

The Size of a Region

As stipulated in Section 107(a)(2), the designation of air quality control regions should be based on "Jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards." This language suggests a number of objectives which are important in determining how large an air quality control region should be. Basically, these objectives can be divided into three separate categories.

First, a region should be self-contained with respect to air pollution sources and receptors. In other words, a region should include most of the important sources in the area as well

as most of the people and property affected by those sources. In this way, all the major elements of the regional problem will lie within one unified administrative jurisdiction. Unfortunately, since air pollutants can travel long distances, it is impractical if not impossible to delineate regions which are completely self-contained. The air over a region will usually have at least trace amounts of pollutants from external sources. During episodic conditions. such contributions from external sources may even reach significant levels. Conversely, air pollution generated within a region and transported out of it can affect external receptors to some degree. It would be impractical and inefficient to make all air quality control regions large enough to encompass these low-level trace effects. The geographic extent of trace effects overestimates the true problem area which should be the focus of air pollution control efforts. Thus, the first objective, that a region be self-contained, becomes a question of relative magnitude and frequency. The dividing line between "important influence" and "trace effect" will be a matter of judgment. The judgment should be based on estimates of the impact a source has upon a region, and the level of pollution to which receptors are subjected. In this respect, annual and seasonal data on pollutant emissions and ambient air concentrations are a better measure of relative influence than short term data on episodic conditions.

The second general objective requires that region boundaries be designed to meet not only present conditions but also future conditions. In other words, the region should include areas where industrial and residential expansion are likely to create air pollution problems in the foreseeable future. This objective requires careful consideration of existing metropolitan development plans, expected population growth, and projected industrial expansion. Such considerations should result in the designation of regions which will contain the sources and receptors of regional air pollution for a number of years to come. Of course, region boundaries need not be permanently fixed, once designated. Boundaries should be reviewed periodically and altered when changing conditions warrant readjustment.

The third objective is that region boundaries should be compatible with and even foster unified and cooperative governmental administration of the air resource throughout the region. Air pollution is a regional problem which often extends across several municipal, county, and even State boundaries. Clearly, the collaboration of several governmental jurisdictions is prerequisite to the solution of the problem. Therefore, the region should be delineated in a way which encourages regional cooperation among the various governmental bodies involved in air pollution control. In this regard, the existing pattern of governmental cooperation on the whole range of urban problems may become an important consideration. Certainly the pattern of cooperation among existing air pollution control programs is a relevant factor.

In general, administrative considerations dictate that governmental jurisdictions should not be divided. Although it would be impractical to preserve State jurisdictions undivided, usually it is possible to preserve the unity of county governments by including or excluding them in their entirety. Occasionally, even this would be impractical due to a county's large size, wide variation in level of development, or striking topographical features.

To the extent that any two of the above three objectives lead to incompatible conclusions concerning region boundaries, the region must represent a reasonable compromise. A region should represent the best way of satisfying the three objectives simultaneously.

As noted above, the evaluation of relevant technical factors and urban factors forms the basis of the boundary proposals published by NAPCA. The evaluation of technical factors is designed to indicate, where possible, the location of pollution sources and the geographic extent of serious pollutant concentrations in the ambient air. The quantity, locations, and nature of air pollutant emissions are determined by conducting an inventory of the various pollutant generators in an area. The transport and distribution of pollutants in the ambient air are analyzed on the basis of measured air quality data, the location of emissions, meteorological data, and topographic information. A mathematical diffusion model, which predicts

ambient pollution concentrations from information on emissions and meteorology, can be used in areas where irregular topographical features do not invalidate the theoretical model. As a whole, the technical study indicates how large the air quality control region must be in order to encompass most pollution sources and most people and property affected by those sources.

The study of urban factors encompasses a different set of considerations. It reviews existing governmental jurisdictions, the location of urban and industrial concentrations, expected patterns of urban growth, cooperative regional arrangements, existing State and local air pollution control programs, and other associated factors. The study of urban factors is designed to indicate how large a region must be in order to encompass expected regional growth and to encourage cooperation among political units in controlling air pollution.

The body of this report contains a proposal for the boundaries of the Metropolitan Albuquerque Intrastate Air Quality Control Region and of technical and urban factors which were the basis of the proposal. The report is intended to serve as the background document for the formal consultation with appropriate State and local authorities.

EVALUATION OF ENGINEERING FACTORS

POLLUTANT EMISSIONS INVENTORY

The compilation of an air pollutant emissions inventory makes possible the correlation of pollutant emissions by type and quantity with specific geographic locations. This procedure is basic to a study of the nature of the air pollution problem in any area.

An emissions survey of metropolitan Albuquerque and vicinity was conducted by the National Air Pollution Control Administration with the cooperation of the New Mexico State Health and Social Services Department and the Albuquerque-Bernalillo County Environmental Health Department. The survey area, shown in Figure 3, consisted of all of Bernalillo County and portions of Sandoval, Socorro and Valencia Counties. This area includes all of the urban development associated with Albuquerque as well as the developed areas located north and south of Albuquerque along the Rio Grande River. The estimated 1969 estimated population of the four counties in their entirety equalled 392,300 persons. Of the 365,000 persons in the survey area (1969), 325,000, or approximately 89% of those persons resided in Bernalillo County. The city of Albuquerque is located in the center of Bernalillo County both east and west of the Rio Grande.

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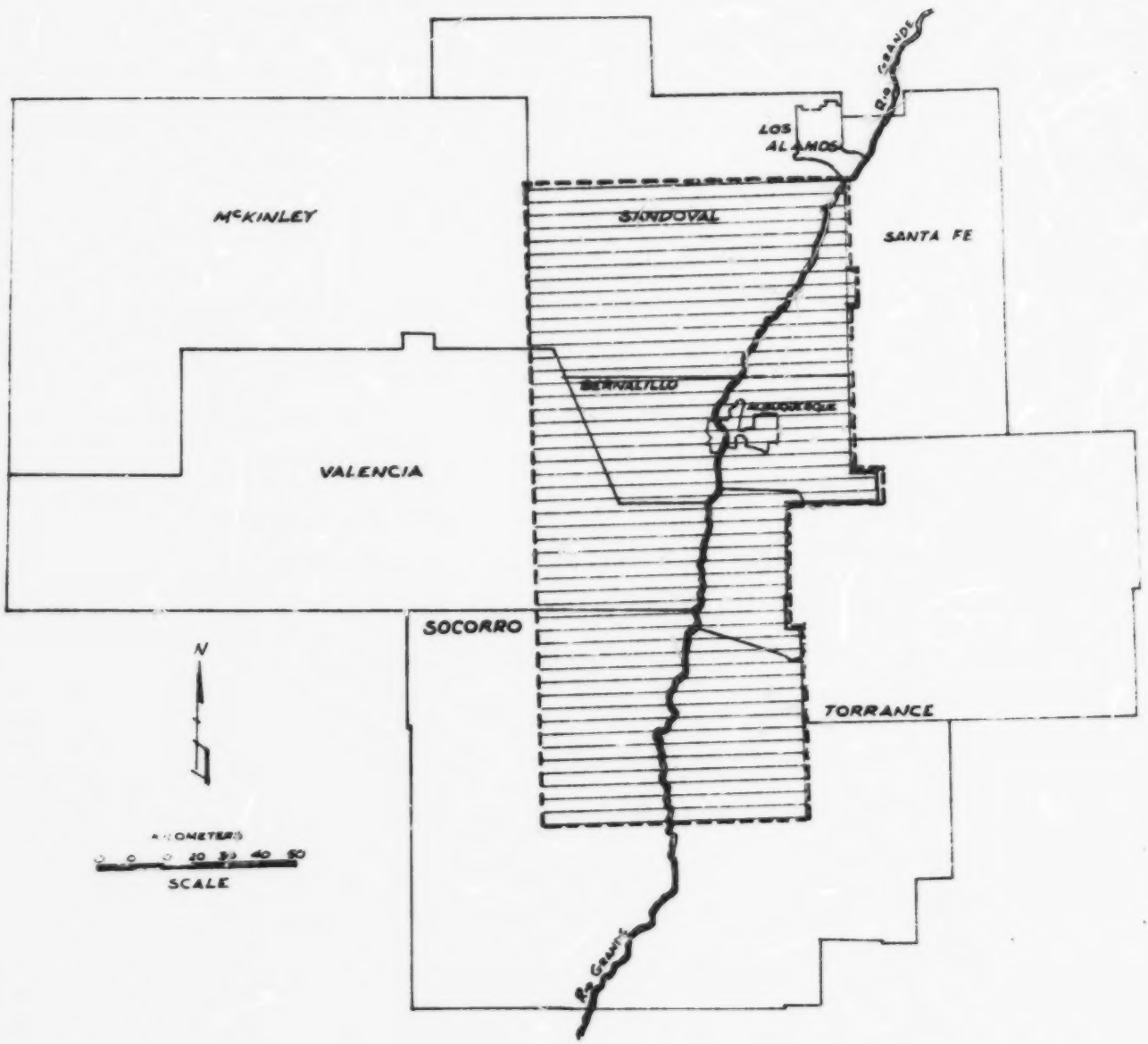

FIGURE 3. EMISSIONS INVENTORY SURVEY AREA.

The Public Health Service rapid survey technique was used for the estimation of pollutant emissions from data representative of the year 1969. Table I provides a county breakdown of surfur oxide, total particulate, carbon monoxide, hydrocarbon and nitrogen oxide emissions by source category and type. These categories are transportation, fuel combustion, (stationary sources) solid waste disposal, industrial processes and evaporative losses. The information provided by Table I indicates that transportation sources accounted for the majority of the sulfur oxide, carbon monoxide, hydrocarbon and nitrogen oxide emissions in the survey area (80%, 93%, 59%, and 69%, respectively). Industrial process losses account for 54% of the estimated total particulate emissions, while transportation sources contribute one-third of the estimated particulate matter. A significant share of SO_x and NO_x emissions are attributable to steam-electric utilities. Evaporative losses contribute approximately one-third of all hydrocarbon emissions. Control officials estimate that the greatest quantities of particulate matter in the Albuquerque area are due to vehicle use of unpaved roads. Estimates of the quantity of pollution attributable to this source were not included in the inventory, however.

As Table I shows, the greatest quantities of the five pollutants considered are emitted from sources within Bernalillo County. The portions of Sandoval, Socorro and Valencia surveyed

TABLE I - SUMMARY OF AIR POLLUTANT EMISSIONS IN THE ALBUQUERQUE STUDY AREA, 1969 (TONS/YEAR)

		TRANSPORTATION		FUEL COMBUSTION IN STATIONARY SOURCES				SOLID WASTE DISPOSAL		INDUSTRIAL		
	COUNTY	Motor Vehicles	Other	Industry	Steam-Electric	Residential	Commercial Institutional	Incineration	Open-Burning	PROCESS LOSSES	EVAPORATIVE LOSSES	COUNTY TOTAL
Sulfur Oxides	Bernalillo	660	370	0	170	40	0	50	30	0	0	1,320
	Sandoval	60	20	0	0	10	0	0	10	0	0	100
	Socorro	70	10	0	0	0	0	0	0	0	0	80
	Valencia	50	20	0	0	10	0	0	0	0	0	80
	Total	830	420	0	170	60	0	50	40	0	0	1,570
Total Particulates	Bernalillo	1,240	1,300	0	140	90	80	220	430	3,130	0	6,630
	Sandoval	110	60	0	0	0	0	0	120	1,880	0	2,170
	Socorro	130	40	0	0	0	0	0	70	10	0	250
	Valencia	100	50	0	0	0	0	0	80	10	0	240
	Total	1,580	1,440	0	140	100	80	220	700	5,030	0	9,290
Carbon Monoxide	Bernalillo	111,770	4,440	0	0	10	0	990	2,290	2,000	0	121,500
	Sandoval	9,440	30	0	0	10	0	0	640	5,010	0	15,130
	Socorro	11,490	20	0	0	0	0	0	380	0	0	11,890
	Valencia	9,010	30	0	0	0	0	0	420	0	0	9,460
	Total	141,700	4,510	0	0	20	0	990	3,740	7,010	0	157,970
Hydro-carbons	Bernalillo	9,270	2,220	0	0	0	0	20	810	170	6,250	18,740
	Sandoval	780	70	0	0	0	0	0	220	420	470	1,960
	Socorro	950	50	0	0	0	0	0	140	0	580	1,720
	Valencia	750	60	0	0	0	0	0	150	0	450	1,410
	Total	11,750	2,400	0	0	0	0	20	1,320	590	7,750	23,830
Nitrogen Oxides	Bernalillo	7,100	2,430	0	3,550	530	460	70	300	10	0	14,450
	Sandoval	600	110	0	0	10	10	0	80	40	0	850
	Socorro	730	80	0	0	10	10	0	50	0	0	880
	Valencia	570	90	0	0	10	20	0	50	0	0	740
	Total	9,000	2,710	0	3,550	560	500	70	480	50	0	16,920

Note: All Estimates Rounded

are responsible for nearly equal, though lesser, quantities of SO_x, hydrocarbons and nitrogen oxides. Substantially greater quantities of particulate matter and CO are emitted in Sandoval County than in either Socorro or Valencia Counties.

Source locations within the survey area were defined by grid coordinates based on the Universal Transverse Mercator (UTM) System. Figure 4 shows the grid system superimposed on a map of the Albuquerque area. Grid squares 5 kilometers on a side were used in areas of intense urban development, while grid zones 10, 20, 30 and 40 kilometers on a side were used in less intensely developed areas. Figures 5, 6, and 7 present emission densities for sulfur oxides, total particulates and carbon monoxide based on this grid system. Figure 8 shows the location of the major point sources in the study area. Generally, the emission density patterns for SO_x, particulates, and CO reflect the urban development pattern and the major point source locations in the Albuquerque area.

AIR QUALITY

Introduction

The regional approach to air resource management requires that those jurisdictions containing the majority of the sources of pollution in a metropolitan area be included within a single air quality control region. An air quality control region should also include jurisdictions containing the majority of the people

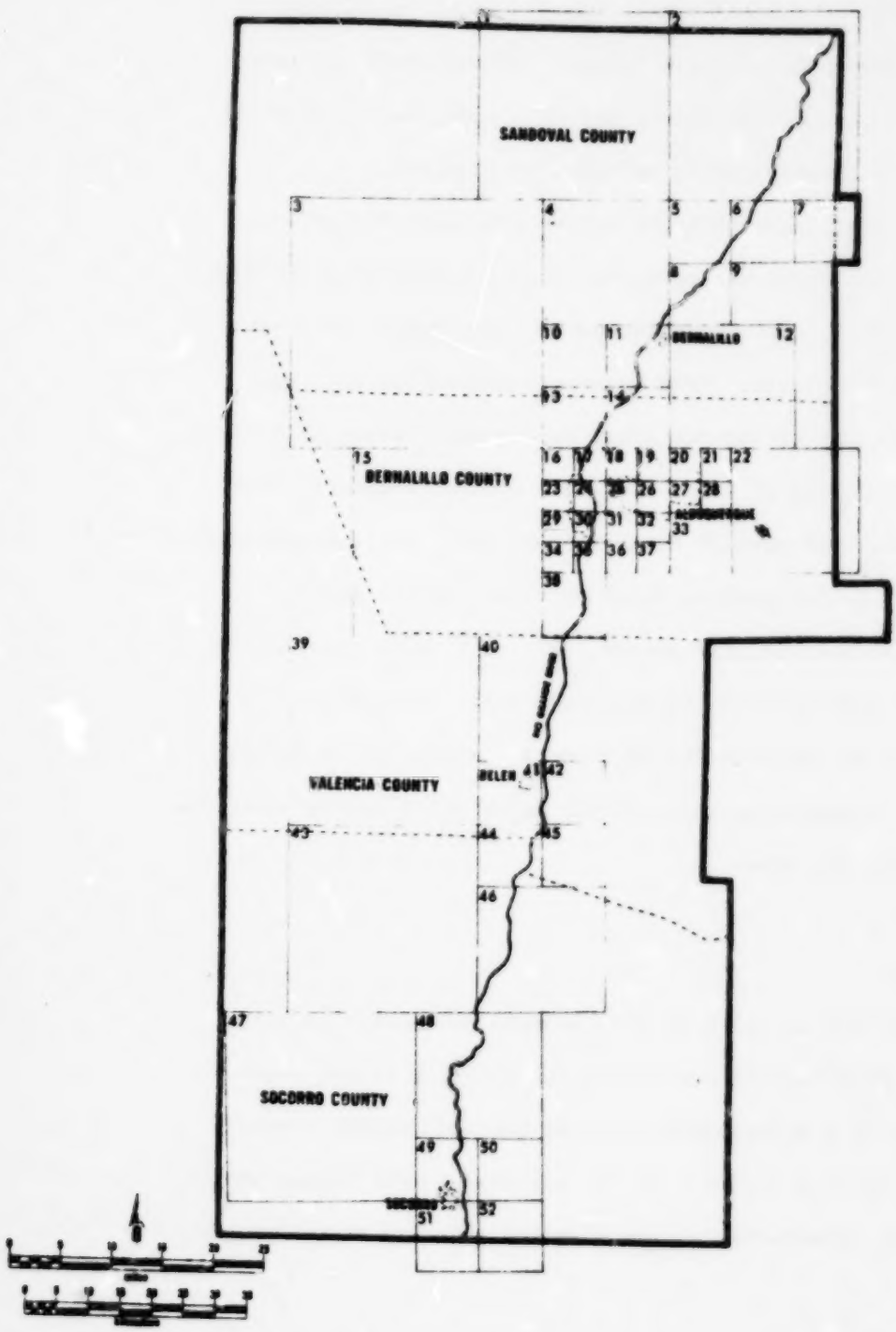

Figure 4. Grid coordinate system for the Albuquerque study area.

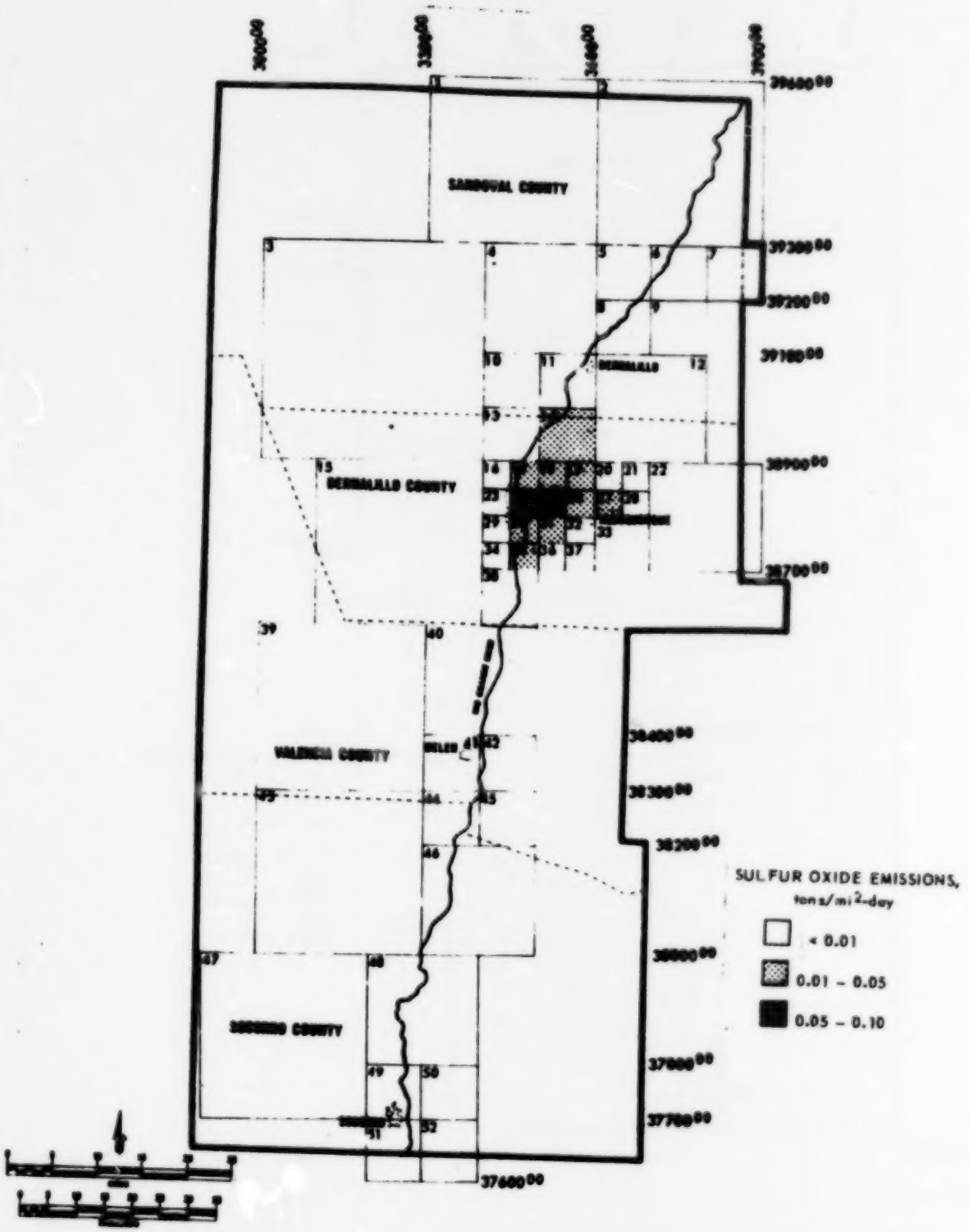

Figure 5. Sulfur oxide emission density map for the Albuquerque study area.

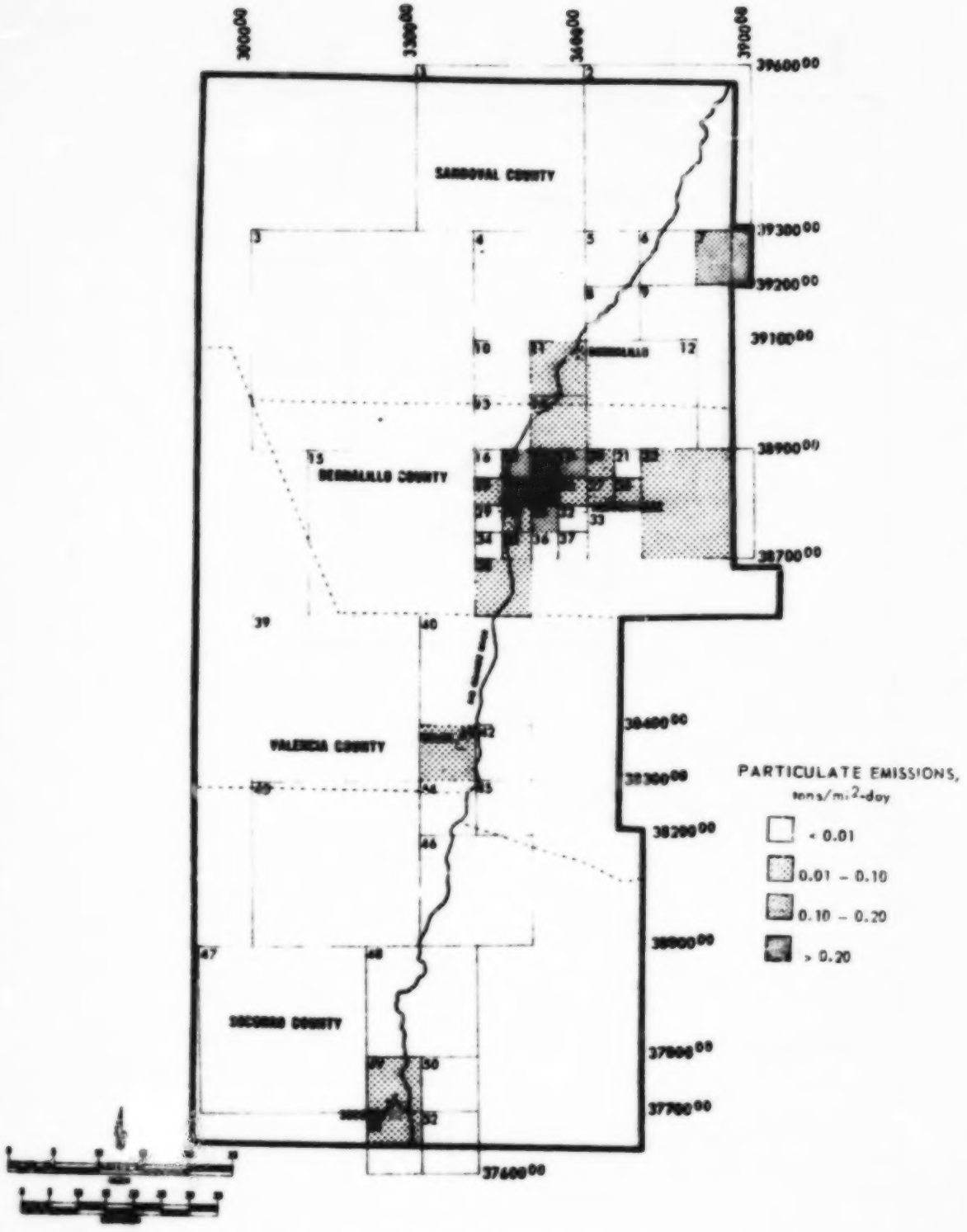

Figure 6. Particulate emission density map for the Albuquerque study area.

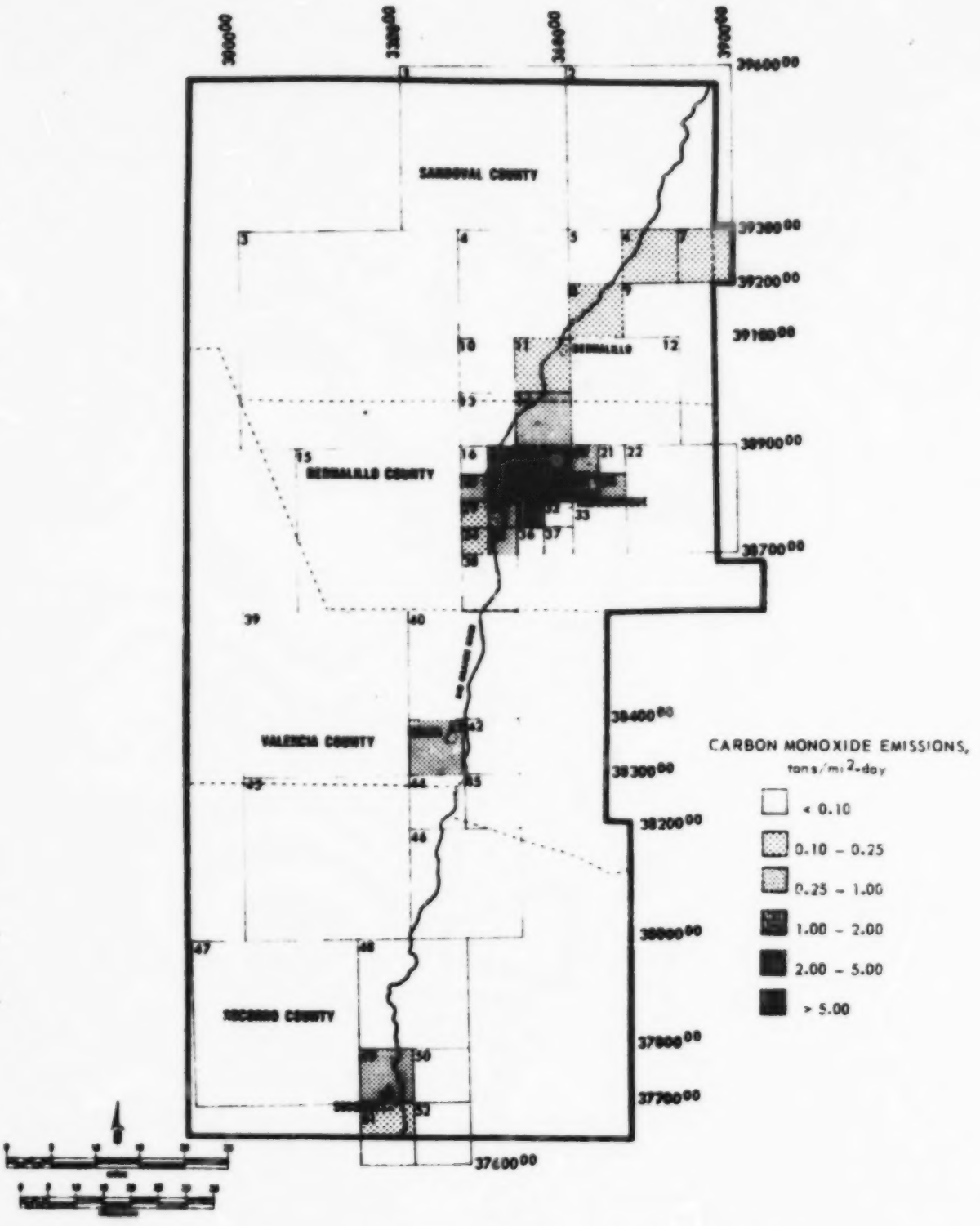

Figure 7. Carbon monoxide emission density map for the Albuquerque study area.

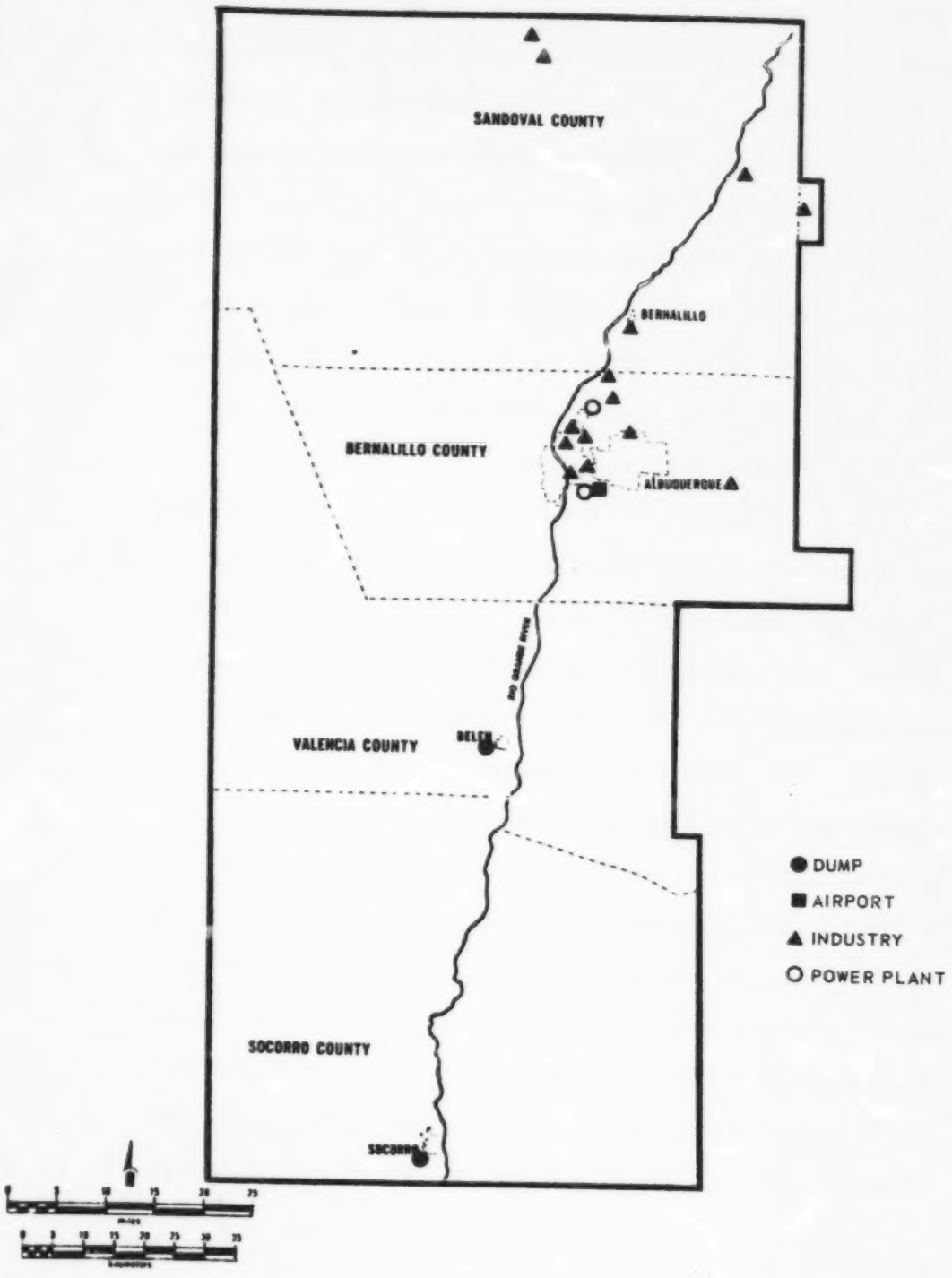

Figure 8. Point source location map for Albuquerque study area.

and property adversely affected by air pollutant emissions from those same sources. The core area of a region can be roughly defined on the basis of pollutant point source locations and relative emission densities. However, information on present levels of pollution in the ambient air is helpful in order that peripheral pollutant receptor areas can be identified. The selection of an essentially self-contained region will result - a region which will include within its bounds virtually the entire source-receptor system for a particular area. By using this approach, the possibility of pollutant cross-boundary transport problems can be minimized.

The following section discusses briefly the factors likely to affect air pollution potential in the Albuquerque area. These factors are topography and meteorology. In addition, a brief discussion of existing air monitoring is presented. Finally, a discussion of the diffusion model predictions of ambient air quality in the study area is presented.

Topography, Meteorology, and Measured Air Quality

Albuquerque is located in central New Mexico within the Rio Grande Valley, oriented in a north-south direction. A wide mesa rises on the west side of the Rio Grande River. To the east, a more narrow mesa slopes gradually upward to the Sandia and Manzano Mountains. The east and west mesa are broken by numerous arroyos and canyons formed by rain water runoff. The largest of these is the Tijeras Canyon, which forms the break

between the Sandia and Manzano Mountains. Differences in elevation in the area are extreme. Elevations vary from less than 5,000 feet above sea level along the Rio Grande River, to nearly 10,700 feet above sea level at the Sandia Crest located 15 miles northeast of Albuquerque. The River Valley narrows to the south in the northern portion of Socorro County. The valley also narrows at Bernalillo in Sandoval County where the river begins a northeast-southwest orientation.

The major summer air circulation pattern in central and western New Mexico results from the southeasterly to southerly flow of warm, moist air from the Gulf of Mexico. This circulation is caused by clockwise flow about the semipermanent Bermuda high pressure area which moves westward in the summer and retreats to the Caribbean in the winter. Except when this high pressure area is in its westermost position, the group of mountain ranges stretching north to south through central New Mexico generally protects the central valley and western New Mexico from much of this moist air. During the winter, the State's air circulation is generally from the west to northwest, as moisture from the Pacific Ocean is forced inland. Much of the precipitation from this moist air is intercepted by mountains before it can reach Albuquerque. Since precipitation is low in the Rio Grande Valley, it does not aid greatly in cleansing the atmosphere of harmful pollutants.

The Rio Grande Valley serves as a channel for the general air circulation patterns it is subjected to. Thus, in the valley, summer winds predominate from the north. Some departure from this rule is evident in areas where local topography alters the direction of the

valley. Winds in the valley are light enough during much of the time through the year so as to be conducive to the formation of atmospheric inversions. Cloud cover, which tends to prevent formation of inversions, occurs less frequently during the morning hours. Since average wind speeds are low in the mornings, inversions occur frequently during the early morning hours. Inversions at or below the 500 foot level in Albuquerque are most frequent during the winter and least frequent during the summer. Afternoon inversions are infrequent throughout the year.

At the present time, air monitoring in the Albuquerque area is conducted by the Air Management Division of the Albuquerque-Bernalillo County Environmental Health Department. The sampling sites are located entirely within Bernalillo County. The network consists of eleven stations measuring suspended particulate matter and eight effects stations. One downtown location is equipped with continuous carbon monoxide and oxidant sensors and with bubblers to collect periodic samples of NO_2, SO_2, aldehydes, ammonia and total oxidants.

The average suspended particulate concentration in Albuquerque between 1957 and 1961 was 183.5 $\mu g/m.^3$ according to national Air Sampling Network (NASN) data. Between 1962-1966 the average concentration equalled 114.6 $\mu g/m.^3$, indicating a statistically significant long-term downward trend in this pollutant. Both these values are, however, greater than the national average for

cities in the National Air Sampling Network of comparable size and greater than those of many larger cities. Again, one of the major pollution problems in Albuquerque is created by dust from unpaved roads.

Diffusion Model Results

A meteorological diffusion model has been used to compute ground-level concentrations of sulfur oxides, carbon monoxide and suspended particulates at specified receptor points. Long-term average relative concentrations are predicted following a mathematical treatment of air pollutant emissions and meteorological data. The diffusion model neglects topographical features for area source emissions and receptor points, and assumes an effective stack height of 75 meters for all point sources. This is an important limitation on the application of the model to the Albuquerque area since its topography is highly irregular and elevation differences are great. The model does, however, have merit in providing reasonable spatial distributions of long-term (seasonal and annual) average pollutant concentrations where topography is least irregular. Concentration contours are shown as dotted lines in areas to the east of Albuquerque where the Sandia and Manzano shield the free-flow of pollutants and would cause dispersion patterns different from those presented in Figures 9 and 10. This mountain range to the east, and the upward slope of areas to the west of Albuquerque, create a valley system which

would tend to compress the isopleths in the east-west direction. From the computed relative concentration contours* for suspended particulates (Figure 9) and carbon monoxide (Figure 10) it appears likely that the Albuquerque core area is linked to a common air pollution problem including at least Bernalillo, Sandoval and Valencia Counties.

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* The numbers associated with these contours represent relative concentrations only and are not to be confused with absolute concentrations of a pollutant.

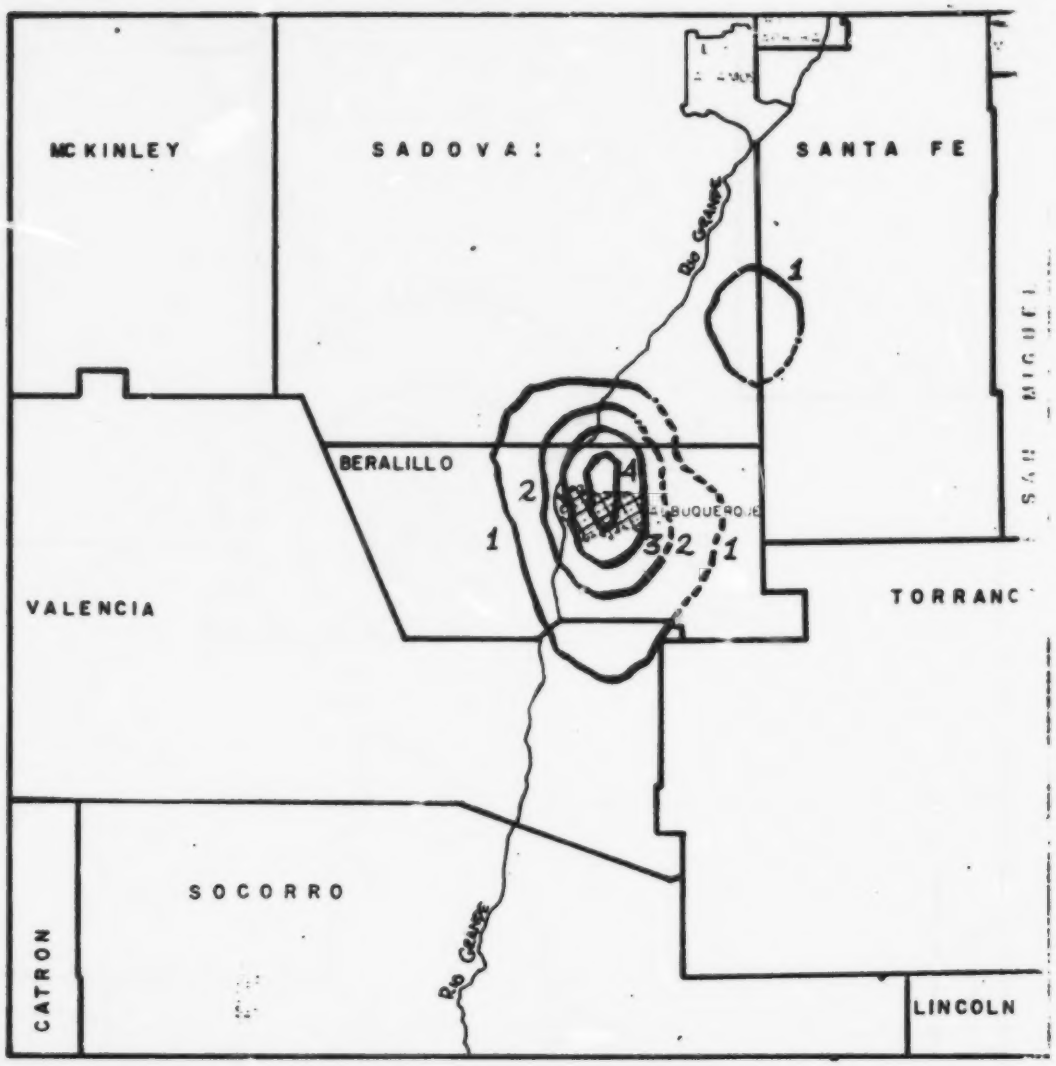
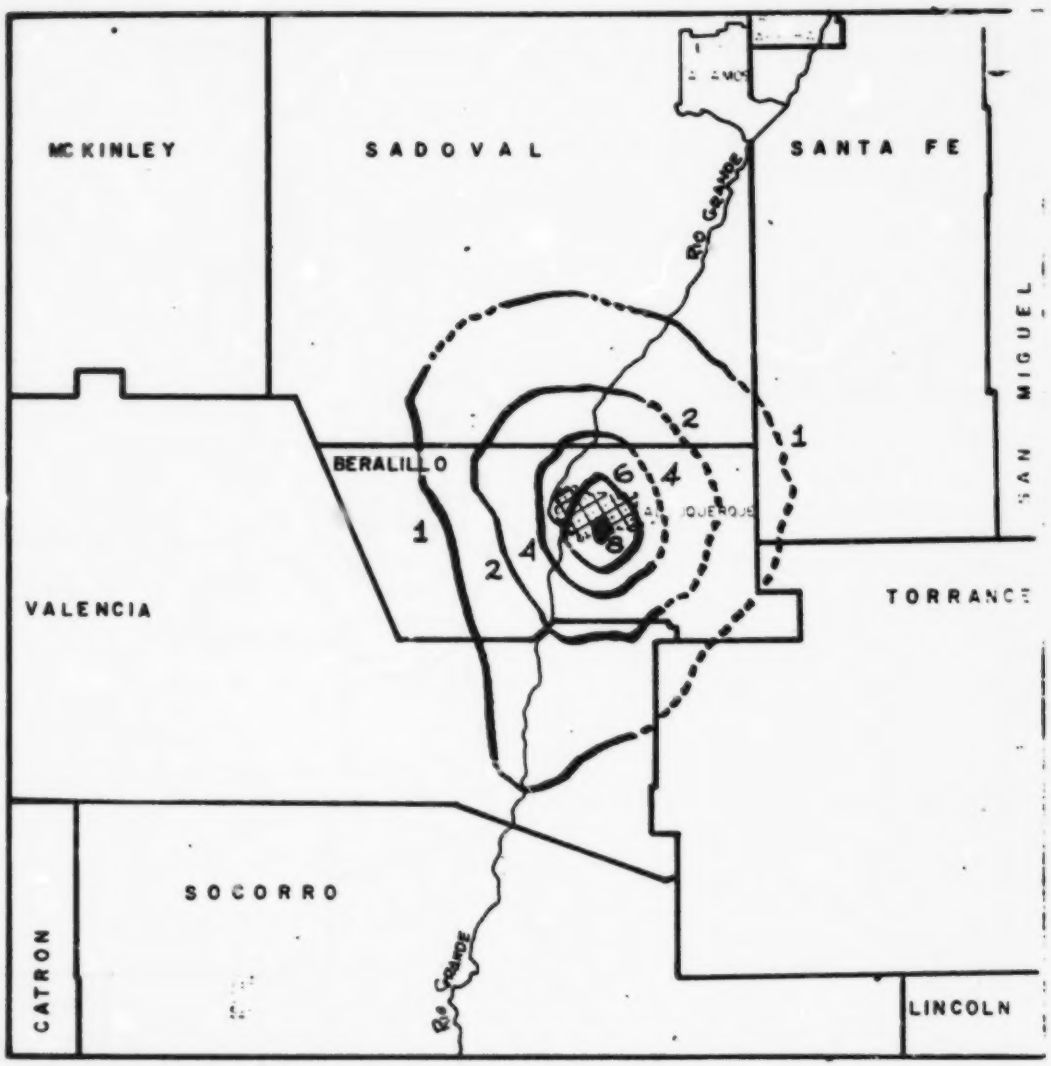


Figure 9. Computed Relative Concentrations of Suspended Particulates (Winter Average).



ALBUQUERQUE REGION

0 5 10 20 30 40 50 60 70 80 90 100 KILOMETERS

Figure 10. Computed Relative Concentrations of Carbon Monoxide (Summer Average).

EVALUATION OF URBAN FACTORS

INTRODUCTION

The Clean Air Act calls for the designation of air quality control regions based on "jurisdictional boundaries, urban-industrial concentrations, and other factors" to provide an intergovernmental system for the prevention and control of air pollution. The designation of air quality control region must also be based on a consideration of existing cooperative regional arrangements, population concentrations, location of industry and patterns and rates of urban growth. The following discussion of urban factors will present these considerations as they apply to metropolitan Albuquerque.

POPULATION DISTRIBUTION

Human activity in its many forms is the basic cause of air pollution. Thus, existing and potential air pollution problems may be related to geographic areas by studying present and projected population statistics for those areas.

Albuquerque is located in the center of Bernalillo County along the east and west banks of the Rio Grande River. The estimated 1970 population of Albuquerque is 262,000, which is about 25% of the population of the entire State. The 1970 estimated population for Bernalillo County in its entirety is 330,000, by far the largest in New Mexico. Clearly, the great majority of those persons residing in Bernalillo County are

within the city of Albuquerque or its metropolitan area. As a consequence, over 92% of the county's population is classified as "urban".

Table II provides present and projected population and employment data for Bernalillo and surrounding counties. As the data indicates, the populations of the outlying counties are small in comparison to Bernalillo. Approximately one-half of the total population of Sandoval and Socorro Counties is located on the banks of the Rio Grande River. Similarly, the population within that portion of Valencia County which lies in the Rio Grande Valley is concentrated along the River.

Bernalillo County is projected to experience a great population growth to the year 1980. Growth on an absolute scale in the surrounding counties will be small by comparison. On a percentage basis, however, the growth in McKinley, Santa Fe and Valencia Counties is projected to be highly significant.

Most of Bernalillo County's growth will be reflective of the growth of Albuquerque and vicinity. Since the Rio Grande Valley widens at the site of Albuquerque, the city has been and will continue to be able to absorb large increases in population. The principle obstacles to future urban expansion of the metropolitan area are the lava beds to the west and the steep Sandia slopes to the east. Much of the recent explosive growth in the city has taken place on the Mesa so that urbanization

TABLE II - PRESENT AND PROJECTED POPULATION AND EMPLOYMENT DATA BY COUNTY

County	Land Area (Mi^2)	1960[1] Population	1970[2] Estimated Population	1980[3] Projected Population	Population Densities (Persons/Mi^2) 1960	1970	1980	Additional Residents/Mi^2 1970-1980	Percent Group 1960-1970	Percent Group 1970-1980	Total Employment 1960[1]	1970[3]	1980[3]	Mfg. Employment 1963
Bernalillo	1,169	262,199	330,000	531,500	224	282	455	173	26%	67%	94,182	140,760	196,510	8,157
McKinley	5,454	37,209	43,000	58,700	7	8	11	3	16%	36%	9,11[illegible]	12,220	18,190	582
Sandoval	3,714	14,201	18,000	18,600	4	5	5	0	27%	3%	2,549	2,960	3,720	173
Santa Fe	1,905	44,970	55,000	82,200	24	29	43	14	22%	49%	14,233	19,890	28,410	771
Socorro	6,603	10,168	11,000	12,700	2	2	2	0	8%	15%	2,793	3,240	3,950	18
Torrance	3,346	6,497	6,000	6,500	2	2	2	0	-8%	8%	1,836	1,790	1,950	NA
Valencia	5,656	39,085	37,300	57,500	7	7	10	3	-5%	54%	11,009	11,270	16,380	130

1. U. S. Census of Population

2. 1970 Commercial Atlas and Marketing Guide, 101st Edition, Rand McNally & Co.

3. Edgel, R. L. "Projections of the Population of New Mexico and its Counties to the Year 2000" Reprinted from "New Mexico Business", 1965

N.A.: Not available

already stretches nine miles to the foot of the Sandias. Because of these natural barriers, growth is likely to be accelerated to the north and south along the Rio Grande and the highway corridor of Interstate 25. It is anticipated that much growth will occur to the east of the Sandia Mountains in Bernalillo County, however. Evidence indicates that Albuquerque's growth has and will continue to influence growth in the adjacent portions of Sandoval and Valencia Counties. Continued growth in Albuquerque may further encourage expansion along Interstate 40 running east-west into Valencia County and Torrance County through the Tijeras Canyon.

MANUFACTURING AND GENERAL ECONOMIC ACTIVITY

The location of manufacturing and other economic activity is helpful in determining the size of an air quality control region. Industrial, agricultural, and other product and income generating activities are often substantial contributors of air pollutant emissions. Following is a brief discussion of these factors as they apply to the Albuquerque study area.

Data presented in Table II indicated that total employment in the study area is presently the greatest in Bernalillo County. Along with this, total employment will undergo its greatest expansion in that same County to the year 1980. This great increase in employment will be accompanied by a significant

increase in its composition. Since World War II, Albuquerque's economy has become greatly diversified, though its principal source of economic support has been Federal expenditures for defense related activities. Urban growth in Albuquerque to the east and southeast has been mainly due to the location of defense installations. In the future the relative importance of this industry will decline. The role of agriculture and all levels of government will similarly decrease in importance. On the other hand, manufacturing and services will increase in importance, though manufacturing at present is less important locally than nationally.

Manufacturing employment is projected to increase by about 50% between 1970 and 1980. Employment in manufacturing is and will continue to be greatest in the food; stone, clay and glass; electrical machinery; printing and publishing; lumber and wood product and fabricated metal industries. Despite large increases in manufacturing employment, Bernalillo County possesses drawbacks to attracting a significant concentration of manufacturing, including small local markets, high land prices and great distances to market concentrations and sources of supply. Nevertheless, manufacturing is expected to play a major role in Bernalillo County's growth. It may be assumed that certain of the industries which will establish themselves in the area may become contributors of air pollutants caused by the various industrial processes.

This, however, cannot be predetermined without more detailed knowledge of the specific industries involved. In relation to Bernalillo County, manufacturing activity in the surrounding counties is small, based on existing employment data, and is likely to remain so.

EXISTING REGIONAL ARRANGEMENTS

The geographic extent of regional planning commissions, councils of local governments, State planning and economic development districts, and region-wide statistical data-gathering bases is an important consideration affecting the selection of air quality control region boundaries. The designation of a region compatible with these regional arrangements, where existing, is desirable since the implementation of a regional air pollution control plan is dependent upon cooperation at the various levels of government.

The Standard Metropolitan Statistical Area (SMSA) for Albuquerque is composed of Bernalillo County in its entirety. The concept of SMSA's provides a measure of the extent of the multijurisdictional independence by identifying those areas felt to be metropolitan in character and economically and socially integrated with a core city.

To encourage and facilitate State and local initiative and responsibility in developing coordinated comprehensive and functional planning, the Governor of New Mexico directed the

State Planning Office to prepare multi-county districts for his consideration. Executive Order No. 1, dated January 2, 1969, established six Planning and Development Districts for the State of New Mexico. These Districts were established after a study of specific factors including population, homogeneity, urban centers, jurisdictions, and other social, economic and historic considerations. District No. 3 includes Torrance, Valencia and Sandoval Counties along with Bernalillo County.

To facilitate a regional approach to common issues, the New Mexico State Legislature passed a Regional Planning Act (Chapter 239, Laws of 1967). This enabling legislation establishes guidelines for the creation of regional planning commissions to help the involved political entities to pursue their mutual interests. In accordance with this legislation, the Middle Rio Grande Council of Governments expanded its jurisdiction to include the four counties in District No. 3 as named above. Its voting members include an additional five municipalities within these four counties. All planning in these four counties is conducted by the Middle Rio Grande Council of Governments.

EXISTING AIR POLLUTION CONTROL PROGRAMS

In the process of defining the boundaries of an air quality control region it is important to consider the role of existing State and local air pollution control programs. It is also important to consider pertinent legislation which grants regulatory

and enforcement powers to these agencies. These considerations are necessary since the ultimate responsibility for implementing region-wide air quality standards rests with State and local governments.

Responsibility for the control of air pollution in New Mexico rests with the Air Pollution Control Program of the State Health and Social Services Department. The Department, as official agent of the Health and Social Services Board, has this authority State-wide in accordance with the 1970 amendments to the 1967 Air Quality Control Act. The Department is empowered to adopt, after public hearings, regulations to prevent or abate air pollution and to prescribe air standards. Regulations have been established to control smoke, open burning, emission of particulate matter, and emissions from several types of industrial plants and processes. Air quality standards have been established for total suspended particulate matters, SO_2, hydrogen sulfide, total reduced sulfur, soiling index and for several elements found in total suspended particulate matter including lead.

On December 29, 1967, the New Mexico State Board of Public Health approved Air Shed Regulation No. 1 which established the Middle Rio Grande Air Shed (shown in Figure 11). The Air Shed includes portions of Bernalillo, Sandoval, Santa Fe, Socorro and Valencia Counties located within the Rio Grande Valley; the boundaries were primarily defined by the 5,800 foot elevation contour. The Board determined that this area possessed common

Middle Rio Grande Air Shed

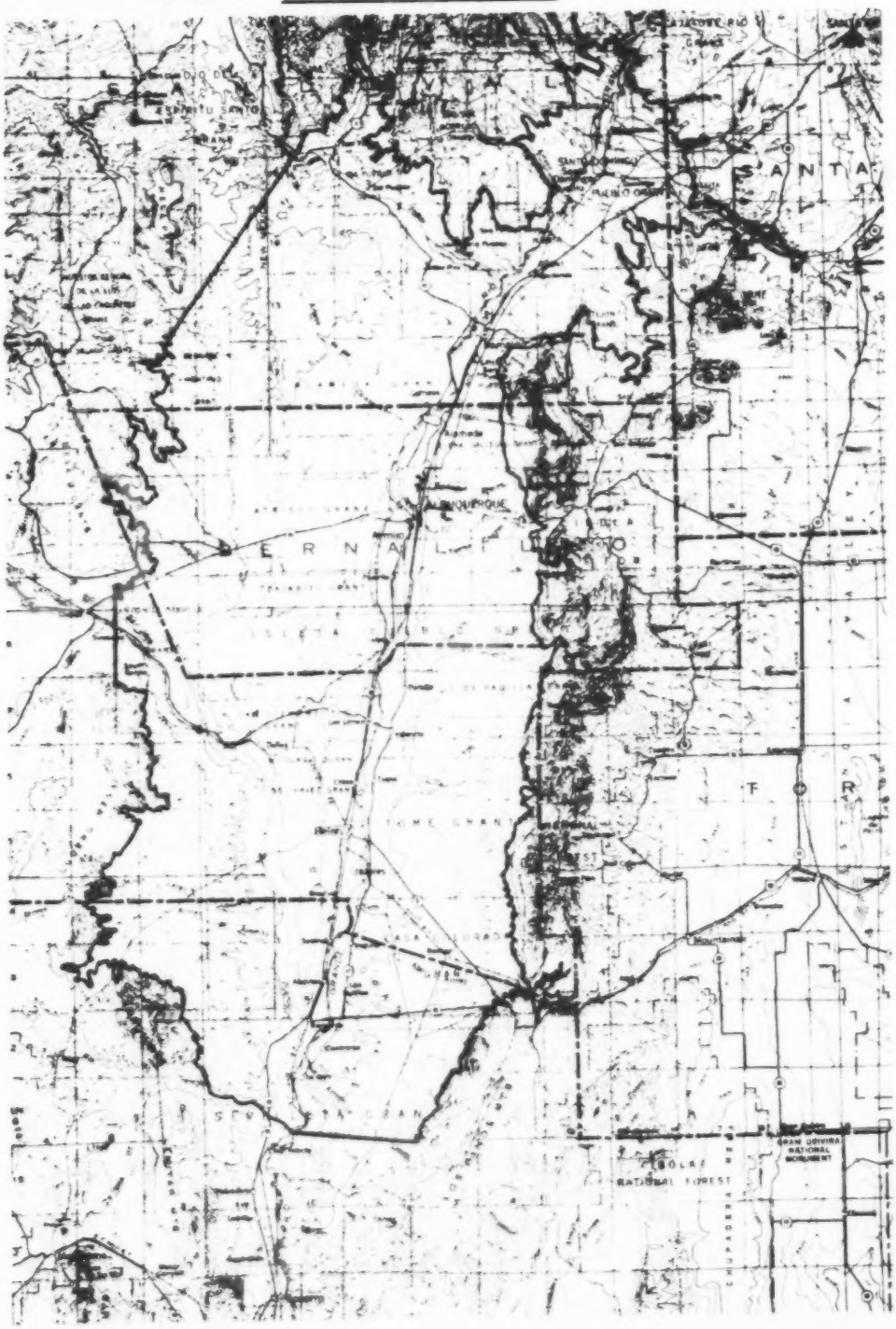


FIGURE 11.

air pollution problems and conditions, based on characteristics of topography, climate and air pollution emission sources, which could best be dealt with by uniform regulation. It was expected that emission controls throughout this area would be more stringent than those necessary for the remainder of the State.

Other provisions of the Clean Air Act, as amended, require the Health and Social Services Department to contract and cooperate with Federal, county and municipal governments in air pollution control efforts. The Department is further directed to adopt a plan for the prevention and abatement of air pollution, recognizing differing requirements and conditions in different areas of the State. The Act also contains provisions for emergency conditions and for court action to secure pollution abatement.

The State Law provides for the local administration and enforcement of the Air Quality Control Act by "A" class counties and municipalities within "A" class counties. This is done by ordinance established pursuant to public hearings. All standards and regulations established with the ordinances must be consistent with the Clean Air Act, as amended, and must not be less stringent than those established by the State. The State Health and Social Services Board retains complete jurisdiction over "A" class counties and municipalities for the administration of the Act

where they fail to act to control pollution.

Responsibility for air pollution within Albuquerque and Bernalillo County (an"A" class county) rests with the Albuquerque-Bernalillo County Air Quality Control Board. Control is effected through the Air Management Division of the Albuquerque Environmental Health Department. The Board has established air quality standards for CO, hydrogen sulfide, total suspended particulates, SO_2, soiling index, lead and oxidants. Air pollution control regulations have been established by the Board for smoke, and for particulate emissions from processes and equipment and other sources. The Board's regulations are not applicable to emission sources expressly regulated by ordinances of Bernalillo County or the city of Albuquerque. These ordinances provide specific regulations for open-burning, incinerators, and motor vehicle air pollution emission control devices. The ordinance of the city of Albuquerque further contains provisions for inspection and enforcement of its regulation and for emergency conditions.

THE PROPOSED REGION

Subject to the scheduled Consultation, the Secretary, Department of Health, Education, and Welfare, proposes to designate an air quality control region for the Albuquerque, New Mexico intrastate urban area. The proposed Region consists of the following jurisdiction in the State of New Mexico (Figure 12):

Bernalillo County in its entirety, plus those portions of Sandoval, Santa Fe, Socorro and Valencia Counties located within the Middle Rio Grande Air Shed as defined in Air Shed Regulation No. 1 adopted by the New Mexico Board of Public Health, December 29, 1967.

As so proposed, the Metropolitan Albuquerque Region would consist of the territorial area encompassed by the outermost boundaries of the above jurisdictions and the territorial area of all municipalities located therein and as defined in Section 302(f) of the Clean Air Act, as amended (42 U.S.C. 1857h(f)).

FIGURE 12. PROPOSED METROPOLITAN ALBUQUERQUE REGION.

DISCUSSION OF PROPOSAL

To implement a successful air resource management program, an air quality control region should be large enough to encompass most air pollution sources as well as most people and property affected by those sources. The boundaries should also include those locations where present development creates, or where projected urbanization and industrialization will create, significant air pollutant problems. Further, the Region should be compatible with or hopefully even foster unified and cooperative governmental administration of the air resource. Finally, a region should be designed to promote efforts aimed toward the protection and enhancement of the air resource in an area. The proposed Albuquerque Intrastate Air Quality Control Region was designed to satisfy, in the best way, these requirements.

Metropolitan Albuquerque lies within the broad valley of the Rio Grande River in central New Mexico. To the east the Sandia and Manzano Mountain Ranges form a natural obstacle not only to the area's urban form, but also to the free flow of air pollutants. The mesa to the west of the river slopes gradually upward and has the same effect, though less obviously so, upon the extent of urbanization and air pollution dispersion. As is typical of mountain-valley configurations, the Rio Grande Valley serves as a north-south channel for the air circulation patterns it is subjected to. Within this valley, atmospheric conditions lead

to the formation of atmospheric inversions which, together with restricted pollutant dispersion potential to the east and west, are likely to intensify the level of air pollution in the area.

The air pollutant emission inventory results indicate that the majority of the air pollutant sources in the middle Rio Grande area are located in or near the city of Albuquerque. Scattered single sources and source complexes are located along the Rio Grande in Sandoval, Socorro and Valencia Counties and western Santa Fe County. The diffusion model results, within the limits of its validity, indicate that Albuquerque's regional problem probably does not extend beyond these areas. In conclusion, the engineering evaluation (based upon existing conditions) indicates that the Albuquerque Region may be reasonably defined in recognition of natural topographical features. The proposed Region, defined to correspond largely to the boundaries of the Middle Rio Grande Valley, is compatible with this conclusion.

As mentioned above, the mountain-valley system in the study area has led to the concentration of population primarily along the Rio Grande River. Rapid growth within Albuquerque has, however, caused urbanization in the east-west direction in recent years. Urban development within metropolitan Albuquerque stretches to the foot of the Sandia Mountains at the present time. Continued urbanization is expected to the east of the Sandia Mountains in

Bernalillo County. This area is accessible through the Tijeras Canyon.

Metropolitan Albuquerque is expected to remain the focal point of growth in central New Mexico, and will be responsible for the projected population and economic growth of Bernalillo County in its entirety. The Federal proposal takes into account the expansion of development in Bernalillo County by recommending inclusion of its entire area in the Region. This consideration of present and projected development provides sufficient justification for the addition of areas not presently included in the Middle Rio Grande Air Shed. In this instance, where mountains are not a complete barrier to urban development, the recommended boundaries, too, must deviate from what would otherwise seem a self-contained air management region - the Middle Rio Grande Air Shed.

Because of the nature of the problem of air pollution, there is always the possibility that pollutant transport into or out of an established region may exist. An air quality control region can never be completely self-contained with respect to sources and receptors of air pollution. The Region proposed herein by the Federal Government is considered to be the most cohesive and yet inclusive area within which an effective regional effort can be mounted to prevent and control air pollution.

Official designation of the Albuquerque Region will follow the formal Consultation with appropriate State and local officials, and after due consideration of comments presented for the record at the Consultation or of those written comments received by the Commissioner of the National Air Pollution Control Administration.